February 10, 2016

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Representative, Triston Cole, Majority Vice-Chair
Representative Ray A. Franz
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Representative Alberta Talabi
Representative Gretchen Driskell
Representative Bill LaVoy
Representative LaTanya Garrett

House of Representatives Agriculture Committee
124 North Capitol Avenue
P.O. Box 30014
Lansing, MI 48909-7514

RE: Information regarding HB 5166, 5167, 5168

Dear Agriculture Committee Members,

I am a Regional Aquaculture Extension Specialist for the North Central Region US, which consists of twelve states within and around the Great Lakes. I am also a native of Michigan and avid fisherman. My credentials include a BS in aerospace engineering, and an MS and PhD in fisheries and wildlife. Today I am representing myself and providing this information as a neutral party for your potential considerations in regards to HB5166, 5167, 5168.

The issue before the House and the people of Michigan centers on whether seafood production should be allowed in Michigan waters of the Great Lakes.

Status of US and Michigan Aquaculture Production

The number of aquaculture facilities in the US dropped 28% between 2005 and 2013. Level of production appears to follow this trend. Value of US aquaculture products, however, increased by 25% over this time frame and is currently about $1.4 billion.

The number and value of commercial Michigan aquaculture facilities producing over 1,000 pounds per year dropped from 43 farms and $2.0 million in 1988, to 35 farms and $1.5 million in 2013. In a 2014 regional survey producers identified regulations as the greatest impediment to industry expansion.

One other note of significance is that the US seafood deficit is second only to oil, and increased by $2.1 billion in 2014. This is the greatest increase to the seafood deficit ever recorded.

Phosphorus

Negative Impact - North Channel Experience

- Cage aquaculture started in Ontario in 1982 and expanding to about 10 facilities through 1980's
- The LaCloche facility opened in the North Channel in 1989
- In 1997 it was investigated by Ontario Ministry of Environment (OMOE) because of public complaints of increased algae growth. Problems were detected and an abatement process was initiated.
- The LaCloche facility ceased operations in May of 1998. In addition, OMOE began an extensive monitoring program of the remaining 8 commercial operations.
- Impacts have been observed (typically right below the cage; positive and negative impacts) but all facilities have maintained compliance with permits with a few minor exceptions as production has increased. Continual Monitoring is now required.

Follow up LaCloche

- Morphometry: 134 ft max depth, deep holes, steep drop offs restricted flow inlet and outlet.
- 2001 – 50% reduction in maximum observed phosphorus, nitrogen, and carbon in sediments (2 yr fallow improvement)

- The consensus from the aquaculture community in Ontario appears to be that the lessoned learned in the North Channel was that this was a classic case of poor siting, and that adequate regulatory oversight was in place for correction.

Background Phosphorus levels in the Great Lakes range significantly.
According to Environment and Climate Change Canada (2009):

- Total Phosphorus Water Quality Objective for Lake Huron is 5 µg/l
- Average Spring Total Phosphorus Concentration in 2009 was measured at 2.7 µg/l, and decreasing.
- Lake Erie Western basin was recorded as 58 µgL in 2009.

Note: Total Phosphorus < 4 µg/l is characteristic of an ultra-oligotrophic system

Lake Huron fishery
Lake Huron Charter Boat Harvests have dropped significantly from 22,600 salmon in 2004, to 4,800 salmon in 2014 (79% decline).

Evidence for the decline points to associations between reduced prey availability, and trophic level response to invasive species. Essentially there is not enough food to support a salmon stocking program further in Lake Huron.

Is it possible that netpens could produce positive impacts to local fisheries?

- NOAA Report (Price and Morris 2013):
  - excess food and waste released from fish cages may be a food source for wild fishes and provide shelter and foraging habitat for fish.
  - These characteristics may be considered a benefit to the local and regional environment
- In addition the Michigan Science Advisory Panel Report (page 20) notes that interaction between anglers and aquaculture operations in Canadian waters is generally seen as a positive for both the aquaculture industry and the recreational angler.

Is it possible that Lake Erie or Saginaw Bay could see impacts from netpen aquaculture?
The most suitable sites for netpen aquaculture in MI are located predominately in northern halves of Lakes Michigan and Huron. The question then becomes whether P loading from netpens in these areas could exacerbate algae blooms in Lake Erie or Saginaw Bay.

According to the Lake Erie Ecosystems Priority (LEEP) report:

- The contribution of total phosphorus loading from Lake Huron to Lake Erie has decreased over the time frame of Ontario cage culture development.

- The average annual load (2005-2010) of phosphorus from a point just below Lake Huron was estimated to be 326 MT.
- Research conducted in 2007 estimated that the annual phosphorus load from the Detroit River alone to Lake Erie was 3,500-4,300 MT.

A 2015 report by Fisheries and Oceans Canada examined ecosystems impacts from dissolved and particulate waste phosphorus:

- Rainbow trout require 0.6% digestible P
- Feed usually contains 0.9-1.4% P
- Excretion by rainbow trout is about 0.5%
- 70% is in particulate form which falls quickly to the sediment
- 30% is in dissolved form, which becomes diluted and rapidly assimilated into the local environment
- Monitoring typically does not detect additional dissolved P outside the cage footprint
- Particulate P in sediments can be released (to reactive dissolved P) under anoxic or acidic conditions
- The likelihood of P inputs from cage culture creating eutrophic conditions in Canadian freshwater environments under current industry production and practices is low.

An adaptive management regulatory framework ensuring no anoxic conditions could further help to mitigate risks of reactive P loading.

Fish waste comparison to human waste

By my estimates:
A city of 65,000 humans produce 21 times more solid waste, and 4.9 times more phosphorus than 200,000 fish.

This is not a good analogy; however, because fish poop does not contain E coli or salmonella. Fish waste can be viewed as a dilute organic fertilizer, which is one reason why aquaponics (growing fish and vegetables together in a single system) is currently receiving allot of attention as a potential sustainable food production system.

Economics (2007 report by Harry Cummings and Associates)

2005, cage culture in Ontario:

- Produced 3,275 MT (7.2 mil lbs) rainbow trout
- Total farm gate $12.5 million, direct + indirect $51 million
- 50 fulltime direct job equivalents, direct + indirect 229 jobs

The study then projected a potential increase by 2017:

- 8,400 MT production
- Farm gate of 34 million, plus an additional $84 million indirect

- 130 full time jobs with an additional 389 indirect jobs

Note: current (2015) production is estimated at approximately 8,000 MT (17.6 million lbs) It appears then that Ontario production has increased from 7.2 million lbs in 2005, to over 17 million lbs today.

- Based on the numbers above the Ontario netpen production could currently be providing economic benefits exceeding $100 million and supporting close to 500 jobs.
- Ontario farmed trout can be purchased at Meijer's and Kroger's here in Lansing at $6.99-9.99/lb.
- Current production levels in Ontario could figuratively provide 327,000 people enough seafood to satisfy their USDA dietary guidelines recommendation for seafood consumption.
- Estimated P loading contribution to Georgian Bay at this level is 5-10%

Recirculating Aquaculture Systems (RAS)

The last RAS system I visited in Michigan raised barramundi. The last big RAS facility in the region reportedly spent more than $70 million over a ten year period. Both of these facilities went out of business in 2015.

I have been working with others across the region to identify US successes and failures. By my estimates, for US RAS to date there have been about 21 successes and 85 failures, or an 80% failure rate. In the North Central Region I estimate an 89% failure rate. The successes are predominately selling to the live ethnic market, and most are growing tilapia. While tilapia has good protein, it has about 1/10th the healthy omega 3 fatty acid content as rainbow trout.

According to a leading US expert in RAS, commercial scale economic viability requires a 2,500 metric ton capacity system. The estimated startup costs for this size facility is in the range of $25-50 million.

Note: aquaponics is similar to RAS at this time in terms of economic uncertainty.

<u>Disease and Invasive Species</u>

- Risks do exist; however, the risks are likely much greater for farmed than wild fish.
- In addition, commercial aquaculture is <u>highly</u> regulated and held to the same standards as State and Federal stocking programs.
  - Health certifications, specific pathogen free fish and eggs from single source.
  - Risk of invasive species is limited mostly to gear transfer and is low / minimal compared to most if not all other associated pathways.

- Numerous examples exist for achievement of risk reduction / elimination through best management practices and biosecurity plans (Ontario, Maine, Washington state)

Escapes and Genetics

The following two species seem ideal for open water culture in Michigan at present:

- Rainbow trout – female triploids
  - Female stocks through genetic selection, available commercially
  - Eggs changed from diploid to triploid by applying mechanical pressure
  - Sterile 99% + (according to a world supplier)
  - Common practice commercially and by some state agencies
  - The state of Michigan stocked over 700,000 triploid salmon from 1986-1991
- Lake whitefish and coho from the Great Lakes also appear as very good candidates
  - Supplement commercial harvest
  - Partnerships

Netpen Potential Areas for Research and Development

The following areas could be considered for research and development provided netpen aquaculture is allowed to move forward:

- Adaptive management framework (Michigan Science Report)
- Lake whitefish production
  - Partnerships with other industry sectors
- Potential negative impacts
- Potential positive impacts
- Fish waste management and utilization
  - Integrated Multi-trophic Integrated Aquaculture systems (IMTA); combining multi species production such as aquatic plants, suspended bi-valves, deposit feeders,...

In closing, thank you for your time, and I hope this information may be useful. If you have any questions regarding regional, national global aquaculture issues do not hesitate to contact me for further discussion.

Sincerely,

Chris Weeks

weekschr@msu.edu
517-353-2298